Overview of the draft Pend Oreille River Total Dissolved Gas Total Maximum Daily Load

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Transboundary Gas Group

Castlegar, BC

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Overview of the Draft Pend Oreille River TDG TMDL

➢ Why a TMDL on the Pend Oreille River?

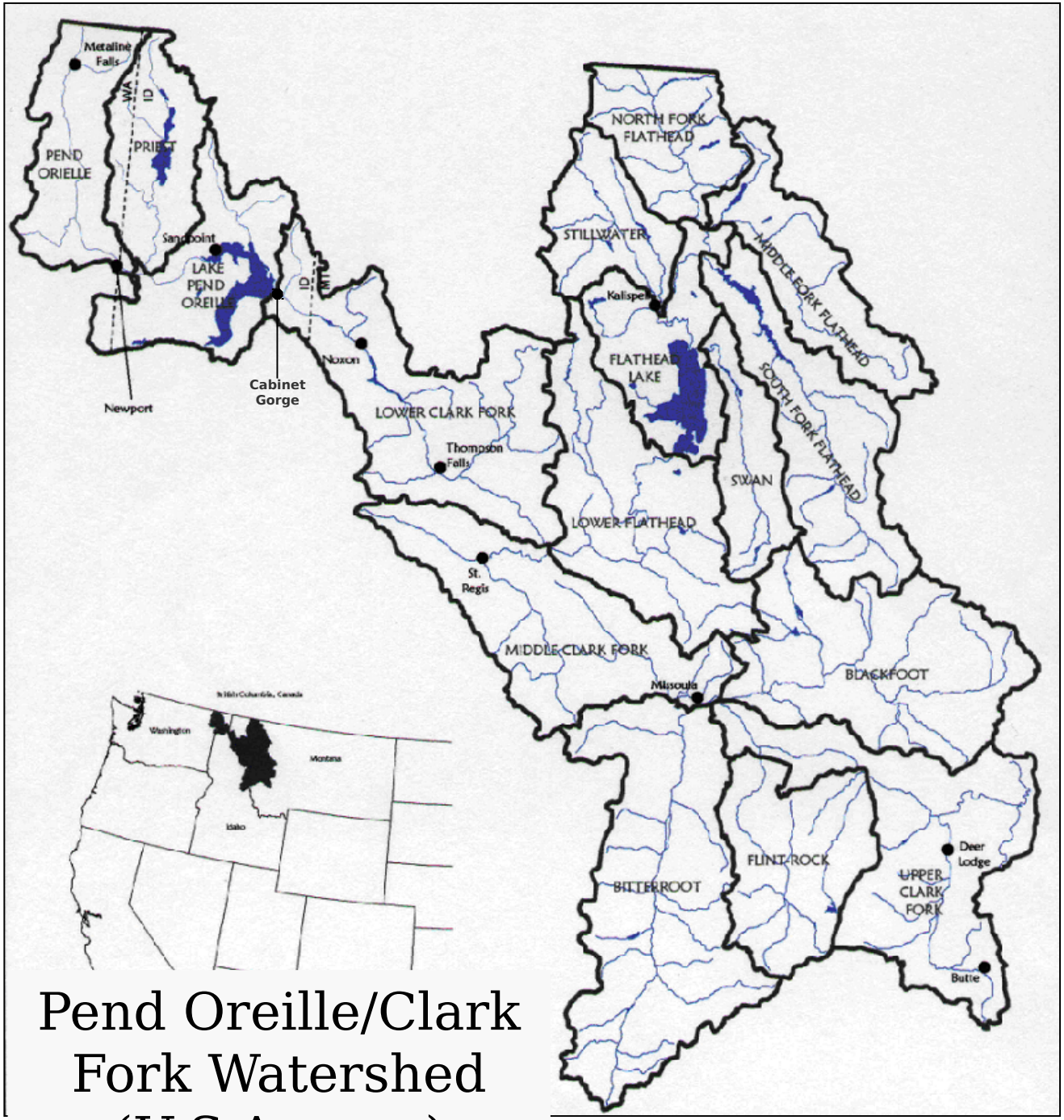
- Total dissolved gas data exceed WA state water quality criteria
- Federal legal requirement: Determine the "total maximum daily load" (TMDL) of pollutants
- TMDL = technical analysis + implementation plan
- Ecology conducted technical studies in 2004 to augment other data and studies

Overview of the Draft Pend Oreille River TDG TMDL

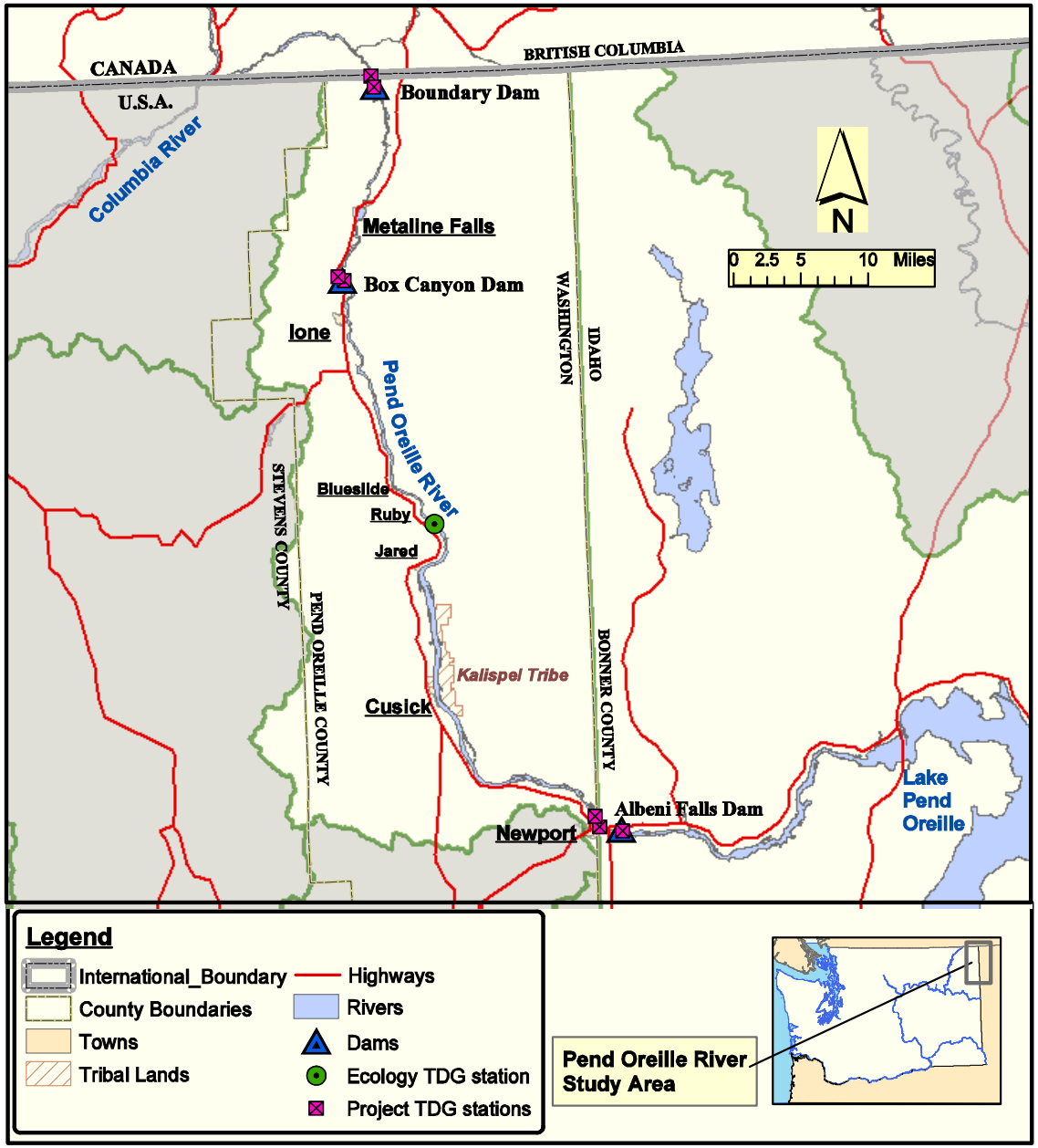
- Geographic scope and jurisdictions
  - Ecology is addressing Washington state waters
    - Idaho border to Canada border
    - Environmental Assessment Program (Olympia): technical
    - Water Quality Program/Eastern Region (Spokane): public outreach & implementation
  - EPA lead for Kalispel Tribal waters
  - EPA also coordinating interstate and international issues

Overview of the Draft Pend Oreille River TDG TMDL

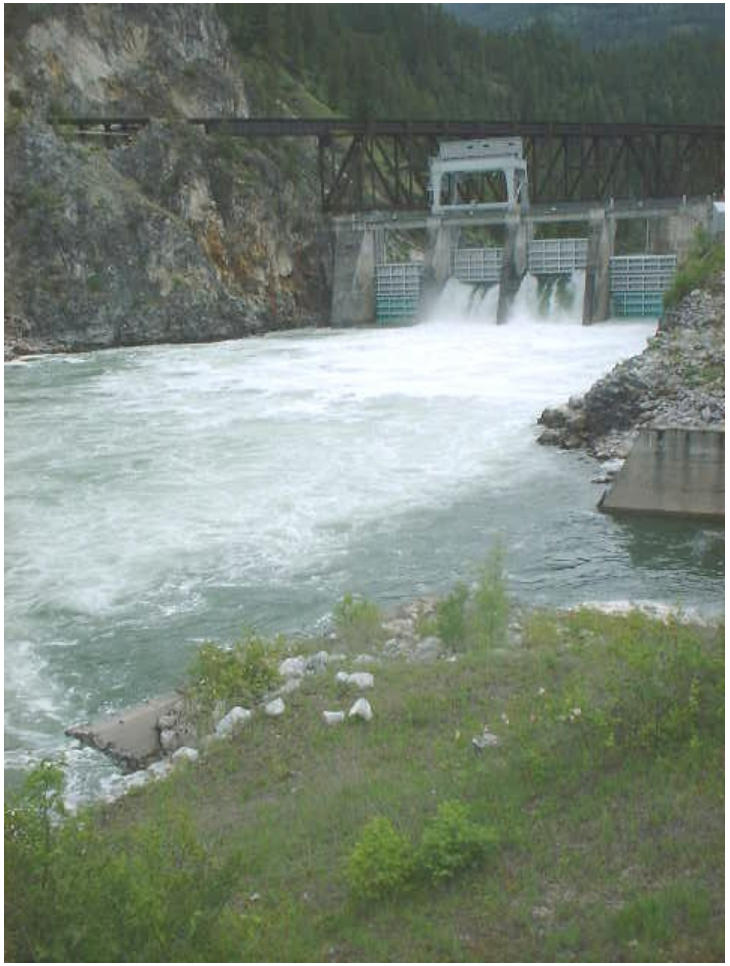
- Dams on the Pend Oreille River
  - Boundary Dam – Seattle City Light
  - Box Canyon Dam – Pend Oreille PUD
  - Albeni Falls Dam – Seattle Army Corps
  - Others upstream on the Clark Fork
- TDG listings in Idaho and Montana
  - Cabinet Gorge FERC 401 certification
  - Other sources in Montana



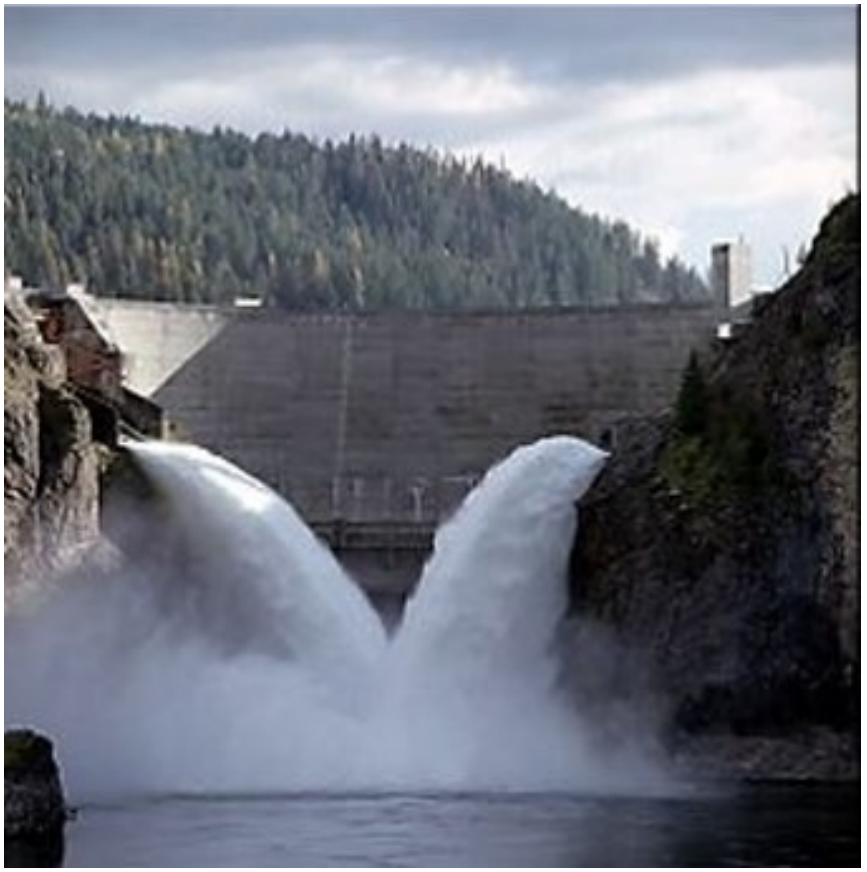
Pend Oreille/Clark Fork Watershed (U.S.A. area)


CANADA
U.S.A.
BRITISH COLUMBIA
Boundary Dam
Columbia River
Metaline Falls
Box Canyon Dam
Ione
Pend Oreille River
WASHINGTON
IDAHO
STEVENS COUNTY
PEND OREILLE COUNTY
BONNER COUNTY
Blueslide
Ruby
Jared
Kalispel Tribe
Cusick
Albeni Falls Dam
Newport
Lake Pend Oreille
N
0 2.5 5 10 Miles
Legend
International_Boundary
County Boundaries
Towns
Tribal Lands
Highways
Rivers
Dams
Ecology TDG station
Project TDG stations
Pend Oreille River Study Area

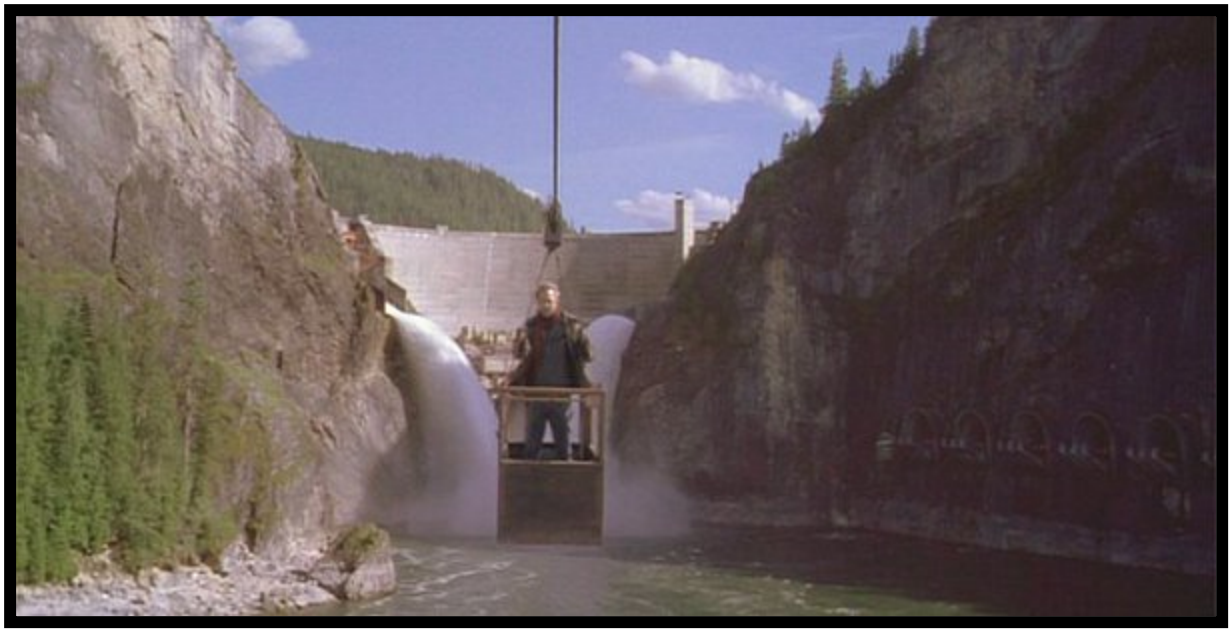
Albeni Falls
Dam



Box Canyon Dam



Boundary Dam



Boundary Dam in the Future (“The Postman”)

Overview of the Draft Pend Oreille River TDG TMDL

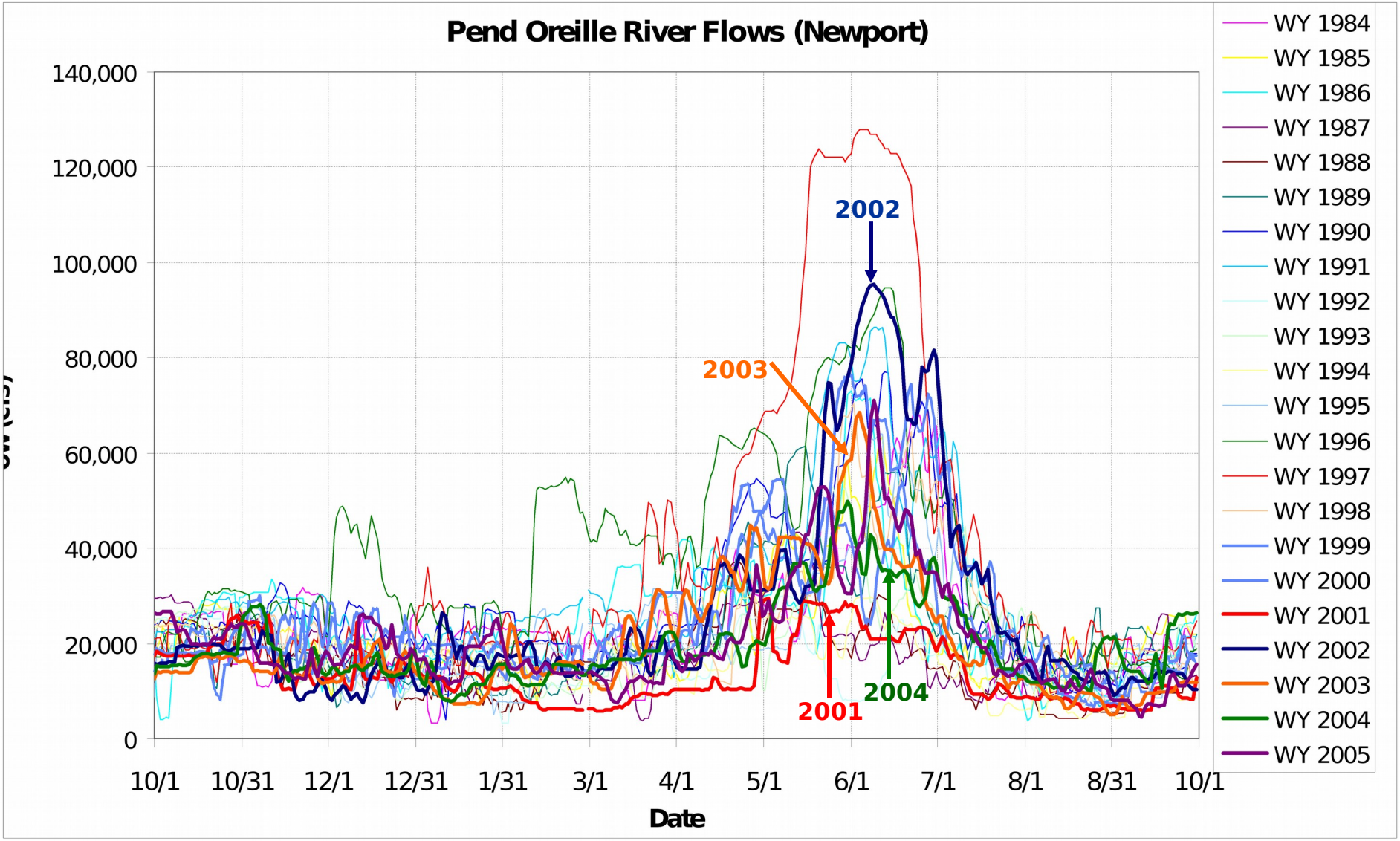
- TDG technical study
  - TDG monitoring by dam owners
    - Albeni Falls, Box Canyon, Boundary
    - Forebay and Tailrace
  - Ecology continuous monitoring
    - Near Ruby – local resident's dock
  - Ecology paired monitoring
    - About every two weeks – "snapshot"
    - Newport, dam forebays, Ecology site
- Project Plan is available
  - http://www.ecy.wa.gov/biblio/0403107.html

Overview of the Draft Pend Oreille River TDG TMDL

Pend Oreille River Flows

- TDG elevated during peak freshet flows
  - Mid-April through mid-July
- Study period flows varied widely
  - 2001 critical low flow year
  - 2002 high flow year
  - 2003 average flow year
  - 2004 low flow year
- 7Q10 flood flows = 105,500 – 108,300 cfs
  - WA standards: criteria only apply below 7Q10 flood

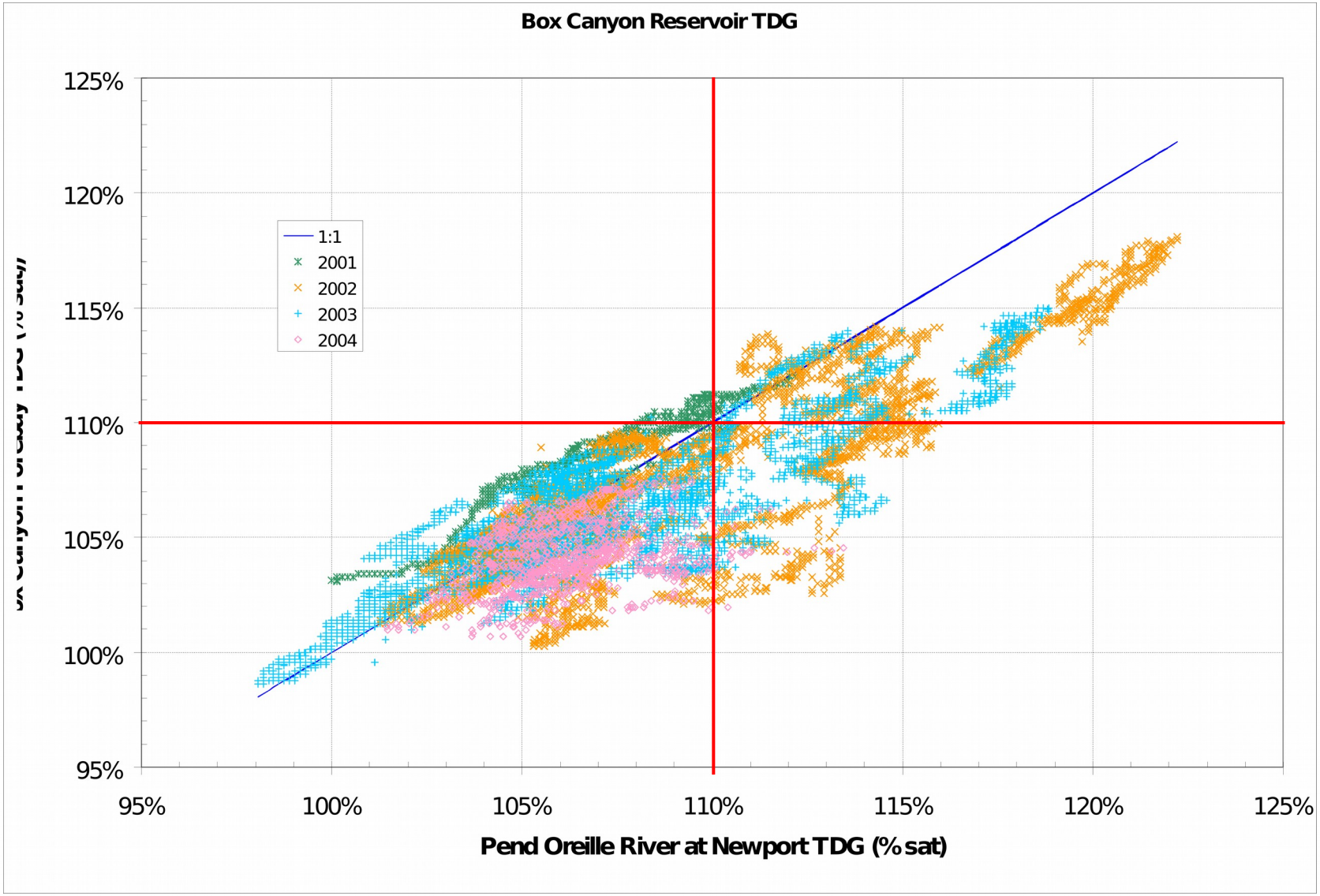
Overview of the Draft Pend Oreille River TDG TMDL



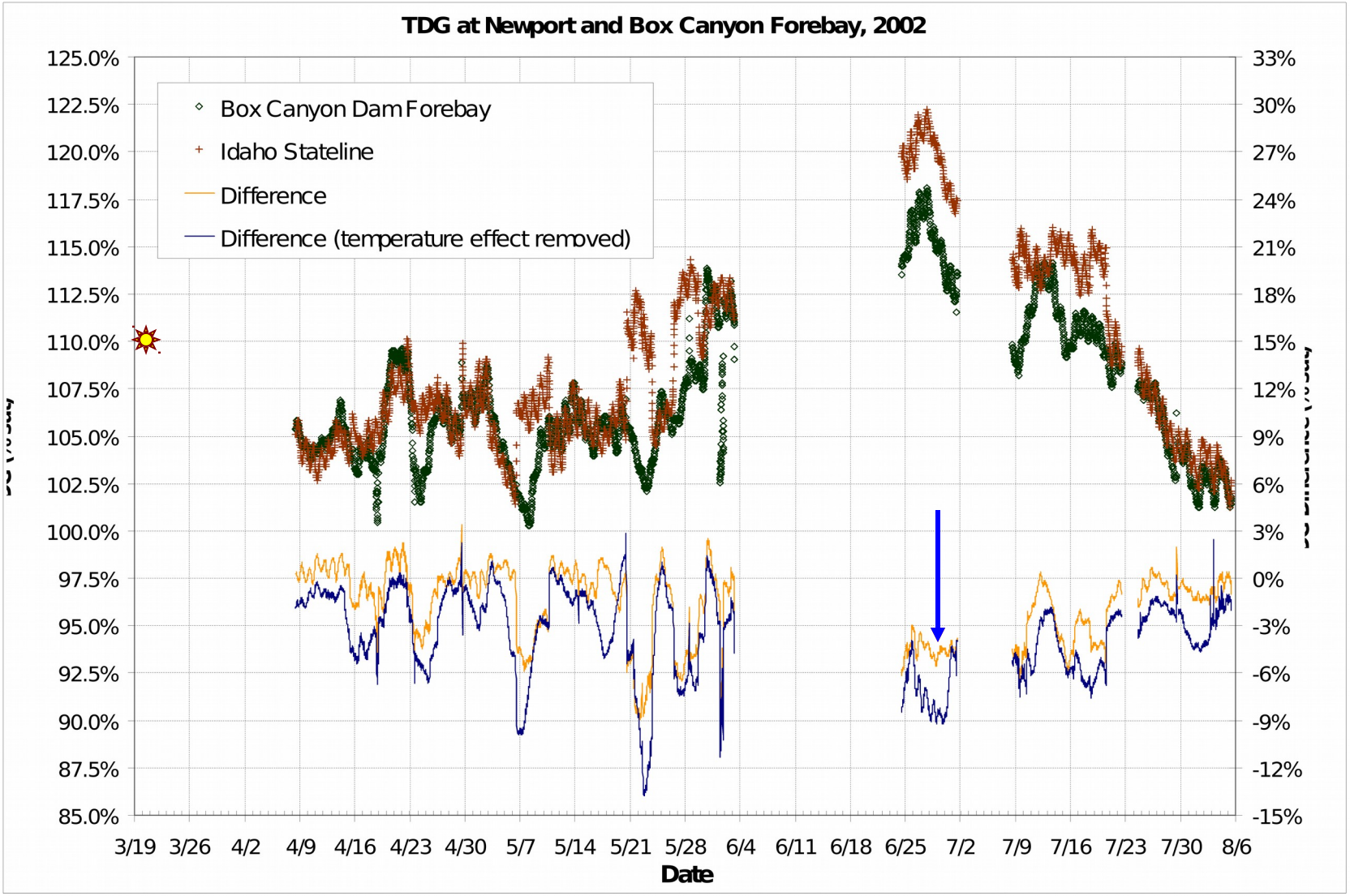
Overview of the Draft Pend Oreille River TDG TMDL

- Box Canyon Reservoir
  - TDG often elevated at Idaho State Line
  - Fate in reservoir evaluated
    - Difference of paired values (Box FB – ID SL)
    - Separate temperature effect from wind and productivity
    - Ecology data from Ruby: separate southern and northern half of reservoir
    - Analyze periods of impairment

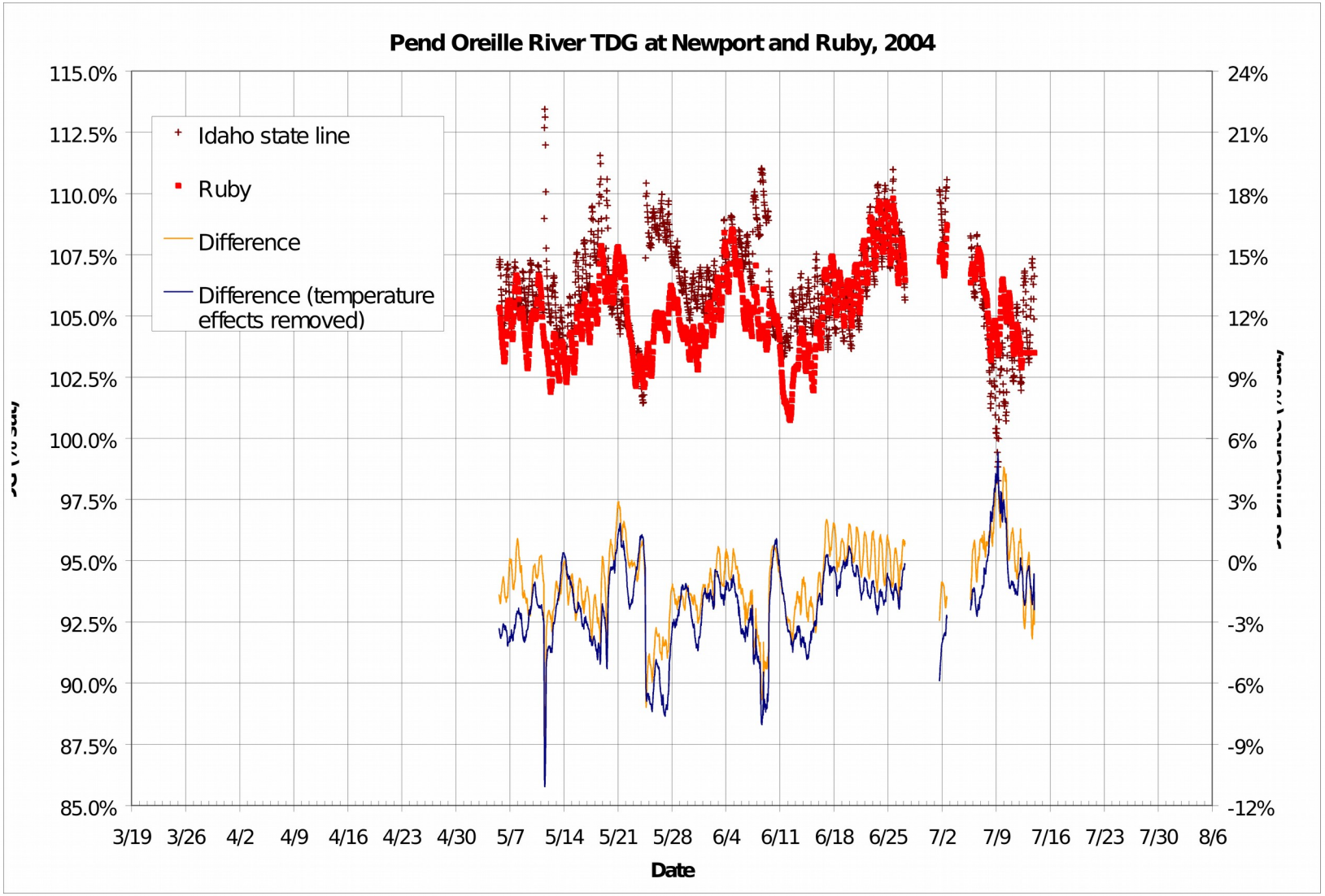
Overview of the Draft Pend Oreille River TDG TMDL



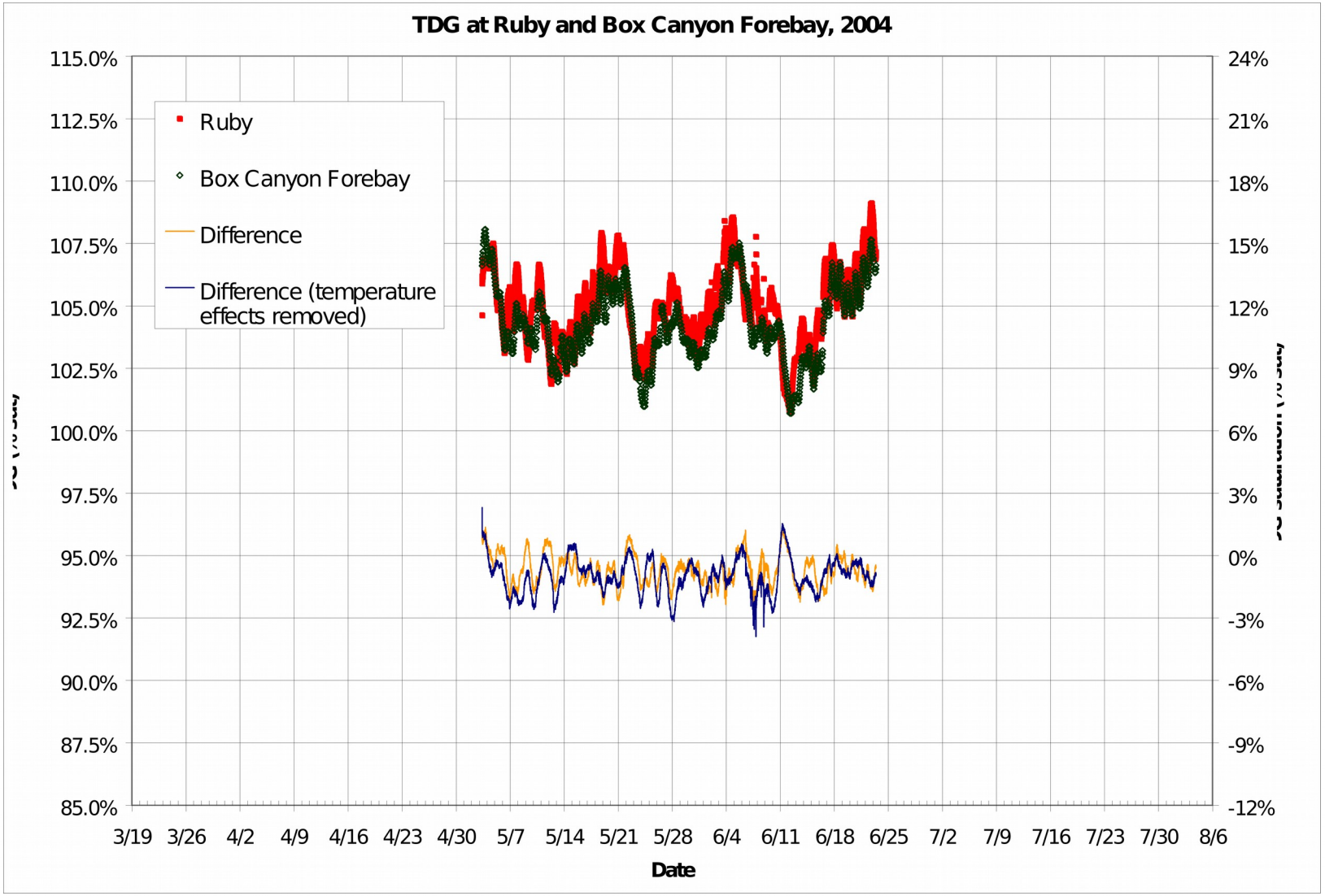
Overview of the Draft Pend Oreille River TDG TMDL



Overview of the Draft Pend Oreille River TDG TMDL



Overview of the Draft Pend Oreille River TDG TMDL



Overview of the Draft Pend Oreille River TDG TMDL

		2001	2002	2003	2004	all years
1.	Total number of data points	1179	7589	7857	1028	17653
2.	Idaho impaired (% of all)	13.7%	33.5%	19.6%	1.5%	24.1%
3.	Box FB impaired (% of all)	22.0%	23.2%	11.0%	0.0%	16.3%
4.	Data points with impairment (% of all)	25.0%	33.5%	19.6%	1.5%	24.9%
5.	Idaho impaired, Box FB not impaired (% of all)	3.1%	10.4%	8.6%	1.5%	8.6%
6.	Idaho not impaired, Box FB impaired (% of all)	11.3%	0.0%	0.0%	0.0%	0.8%
7.	Number of data points with impairment	295	2546	1539	15	4395
8a.	Temperature increases impairment (% of points with impairment)	68.5%	96.8%	75.0%	93.3%	87.2%
8b.	Productivity and wind increases impairment (% of points with impairment)	58.6%	2.7%	11.2%	0.0%	9.4%
8c.	Net pool effect increases impairment (% of points with impairment)	80.7%	4.9%	10.1%	0.0%	11.8%
9.	Net pool effect increases impairment (% of all)	20.2%	1.6%	2.0%	0.0%	2.9%
10.	Temperature increases TDG (% of all)	84.3%	96.2%	76.9%	90.8%	86.5%
11.	Productivity and wind increases TDG (% of all)	54.3%	4.6%	31.3%	2.8%	19.7%
12.	Net pool effect increases TDG (% of all)	81.4%	27.1%	40.7%	12.9%	36.0%
13.	Pool effect, Idaho not impaired, Box FB impaired (median percent of saturation)	**0.4%**				**0.4%**
14.	Pool effect, all impairments (median percent of saturation)	**0.3%**	**-4.2%**	**-3.5%**	**-6.4%**	**-3.8%**
15.	Pool effect, all measurements (median percent of saturation)	**1.1%**	**-0.8%**	**-0.7%**	**-2.0%**	**-0.7%**

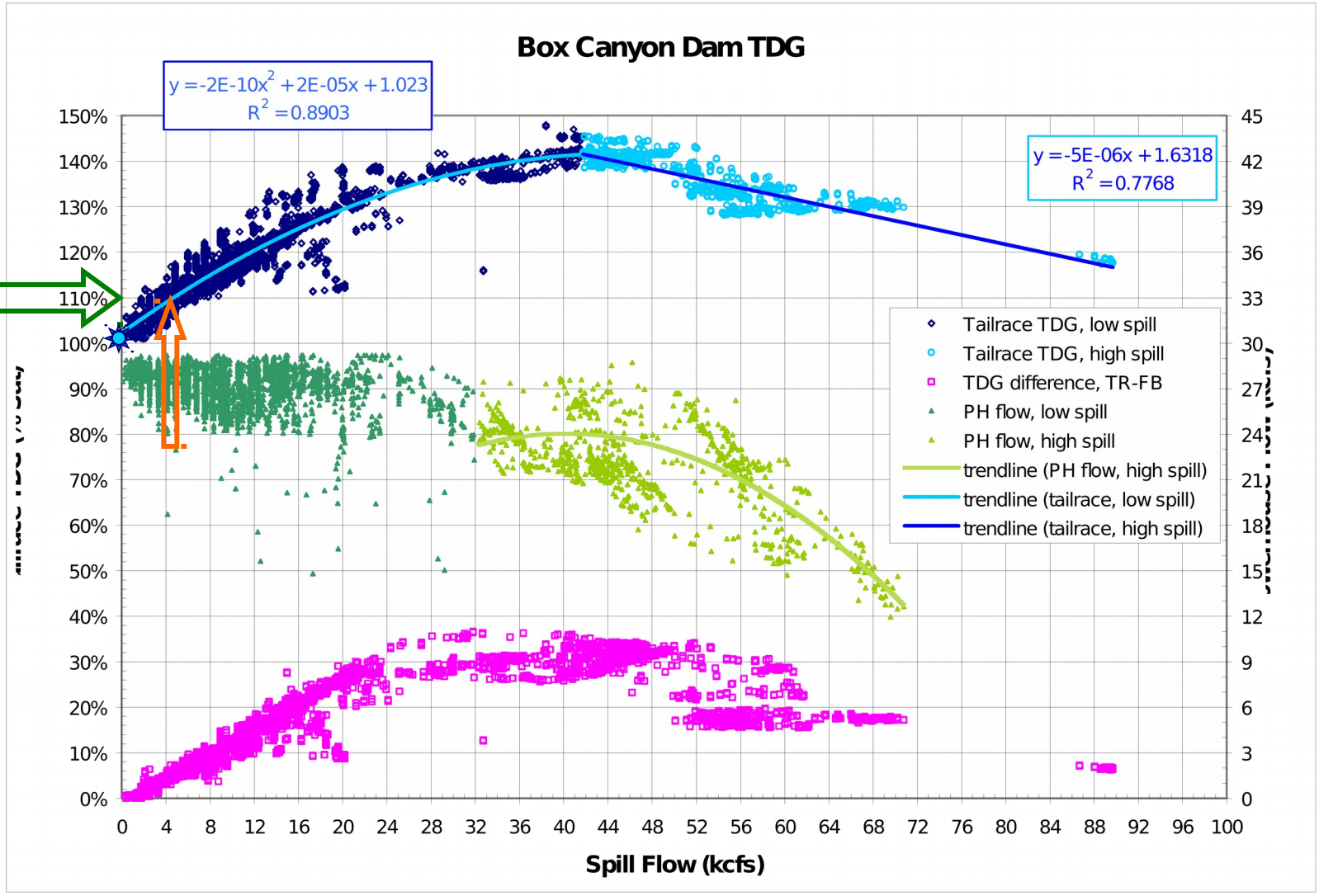
Overview of the Draft Pend Oreille River TDG TMDL

- Box Canyon Reservoir Analysis of Impairments
  - Most impairments caused by conditions upstream of Washington
  - Effect of Temperature usually offset by wind or productivity
  - Increase in TDG producing impairment is rare
    - Amount of increase is small

Overview of the Draft Pend Oreille River TDG TMDL

- Box Canyon Dam TDG Generation
  - Rising flows force spill
  - Rising river levels decrease powerhouse efficiency
    - Powerhouse shuts down at high flows (around 85 kcfs)
  - As river rises, TDG generation peaks, then drops
    - Rising tailrace river levels reduce height of spill
  - Currently, spills above about 5 kcfs impair TDG

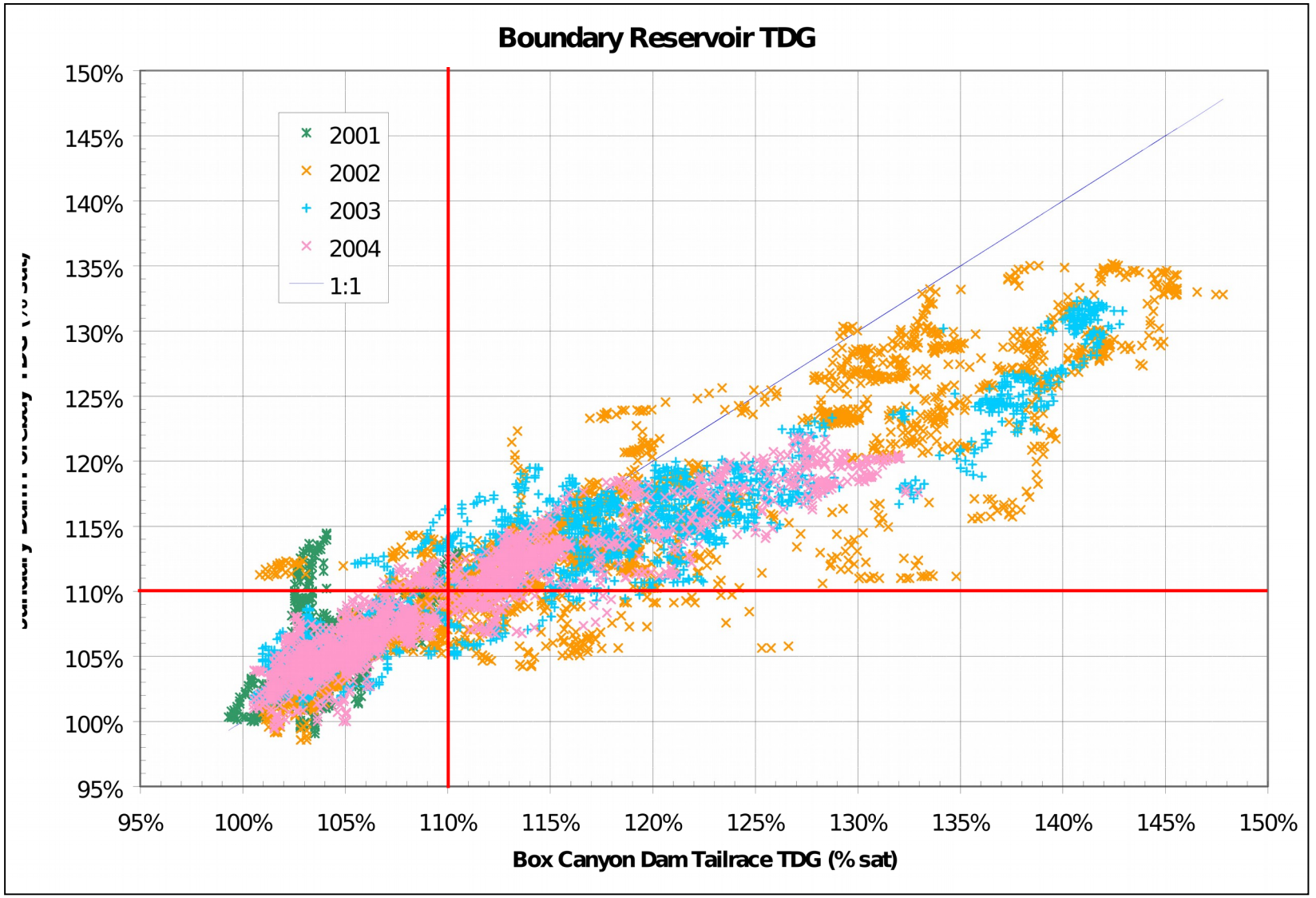
Overview of the Draft Pend Oreille River TDG TMDL



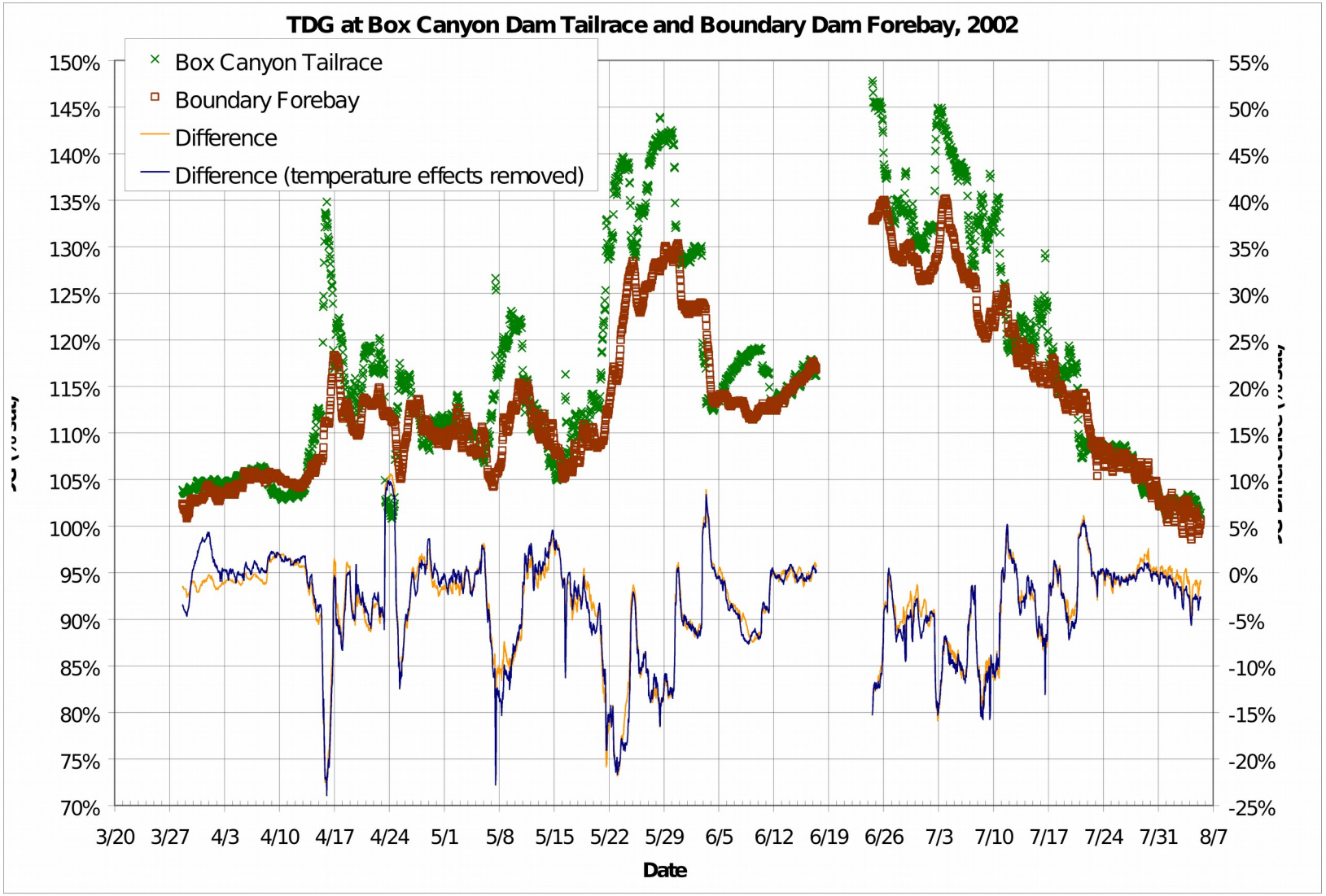
Overview of the Draft Pend Oreille River TDG TMDL

- Boundary Reservoir
  - TDG often elevated from Box Canyon and Idaho
  - Fate in reservoir evaluated

Overview of the Draft Pend Oreille River TDG TMDL



Overview of the Draft Pend Oreille River TDG TMDL



Overview of the Draft Pend Oreille River TDG TMDL

		2001	2002	2003	2004	All years
1.	Total number of data points	766	2509	1942	1808	7025
2.	Box TR impaired (% of all)	3.9%	62.9%	56.5%	39.7%	48.7%
3.	Boundary FB impaired (% of all)	13.6%	58.9%	56.7%	37.7%	47.9%
4.	Data points with impairment (% of all)	14.0%	66.7%	59.2%	42.7%	52.7%
5.	Box TR impaired, Boundary FB not impaired (% of all)	0.4%	7.8%	2.4%	5.0%	4.8%
6.	Box TR not impaired, Boundary FB impaired (% of all)	10.1%	3.8%	2.7%	3.0%	4.0%
7.	Number of data points with impairment	107	1674	1149	772	3702
8a.	Temperature increases impairment (% of points with impairment)	0.0%	50.3%	51.8%	40.9%	47.4%
8b.	Productivity and wind increases impairment (% of points with impairment)	100.0%	18.2%	19.5%	24.6%	22.3%
8c.	Net pool effect increases impairment (% of points with impairment)	93.5%	18.8%	17.4%	19.7%	20.7%
9.	Net pool effect increases impairment (% of all)	13.1%	12.6%	10.3%	8.4%	10.9%
10.	Temperature increases TDG (% of all)	32.8%	49.8%	49.8%	36.7%	44.6%
11.	Productivity and wind increases TDG (% of all)	74.3%	28.9%	42.4%	57.1%	44.8%
12.	Net pool effect increases TDG (% of all)	63.8%	23.8%	42.2%	46.9%	39.2%
13.	Pool effect, Box TR not impaired, Boundary impaired (median percent of saturation)	**1.0%**	**1.3%**	**2.3%**	**0.9%**	**1.3%**
14.	Pool effect, all impairments (median percent of saturation)	**0.8%**	**-3.6%**	**-4.9%**	**-1.9%**	**-3.3%**

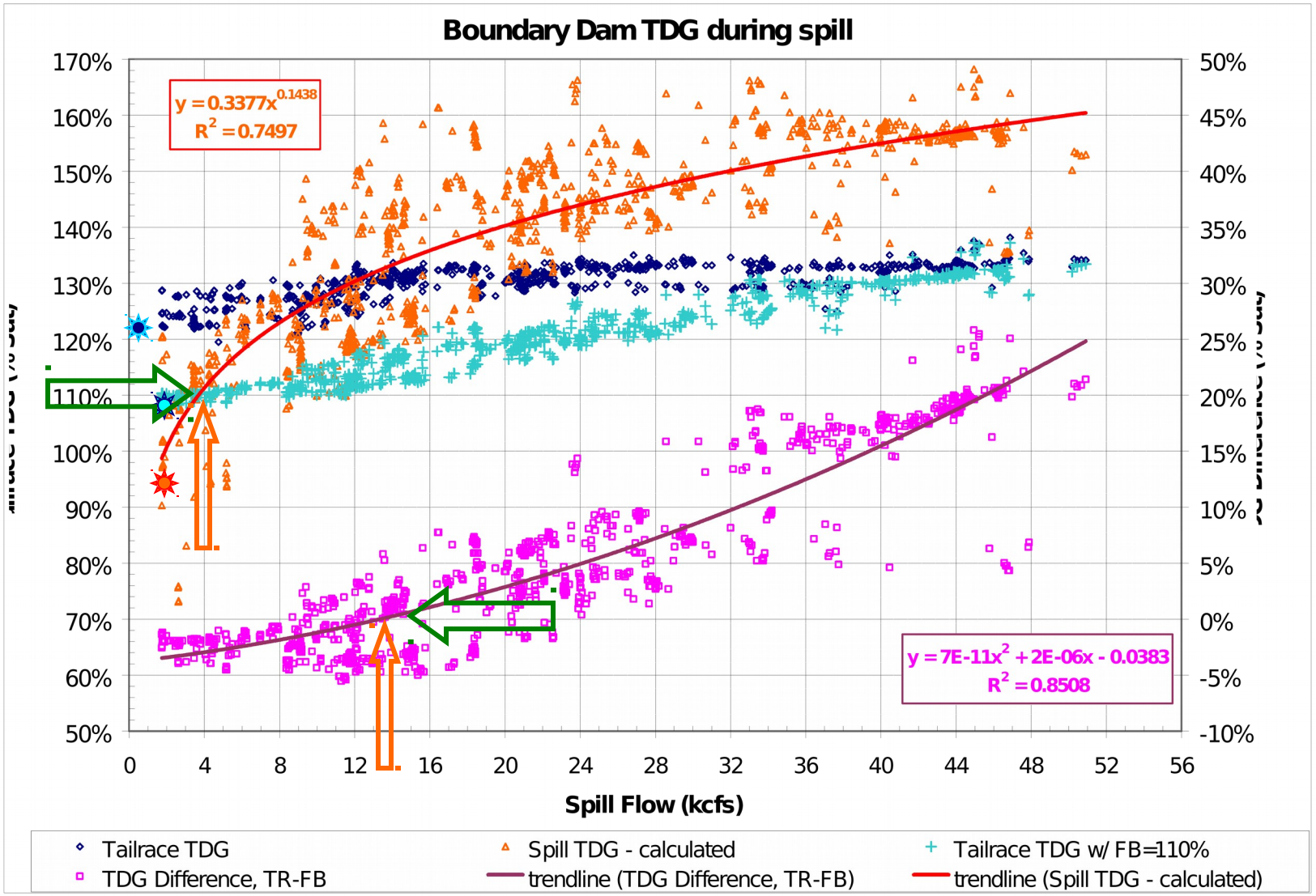
Overview of the Draft Pend Oreille River TDG TMDL

- Boundary Reservoir Analysis of Impairments
  - Most impairments caused by Box Canyon Dam and upstream conditions
  - Effect of Temperature usually offset by wind or productivity
  - Increase in TDG producing impairment is rare
    - Amount of increase is small

Overview of the Draft Pend Oreille River TDG TMDL

- Boundary Dam TDG Generation by <u>spill</u>
  - High upstream TDG levels “mask” effect of spill
    - Spill above 14 kcfs causes increase of tailrace TDG above forebay levels
  - Spill TDG generation can be estimated by back-calculation (with a few simplifying assumptions)
    - Tailrace TDG if forebay were in compliance can be estimated
  - If forebay were in compliance, spills above 4 kcfs would impair TDG

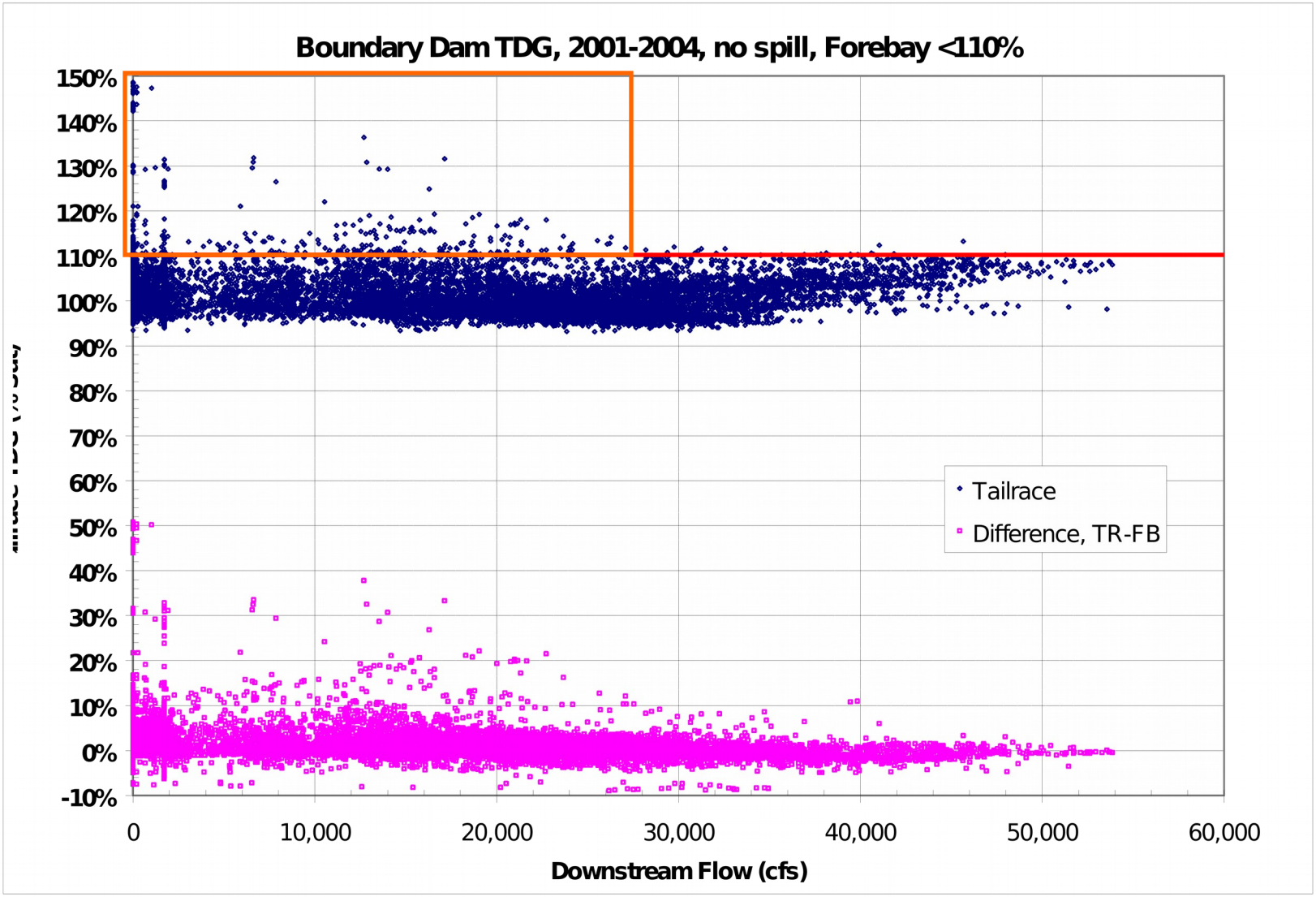
Overview of the Draft Pend Oreille River TDG TMDL



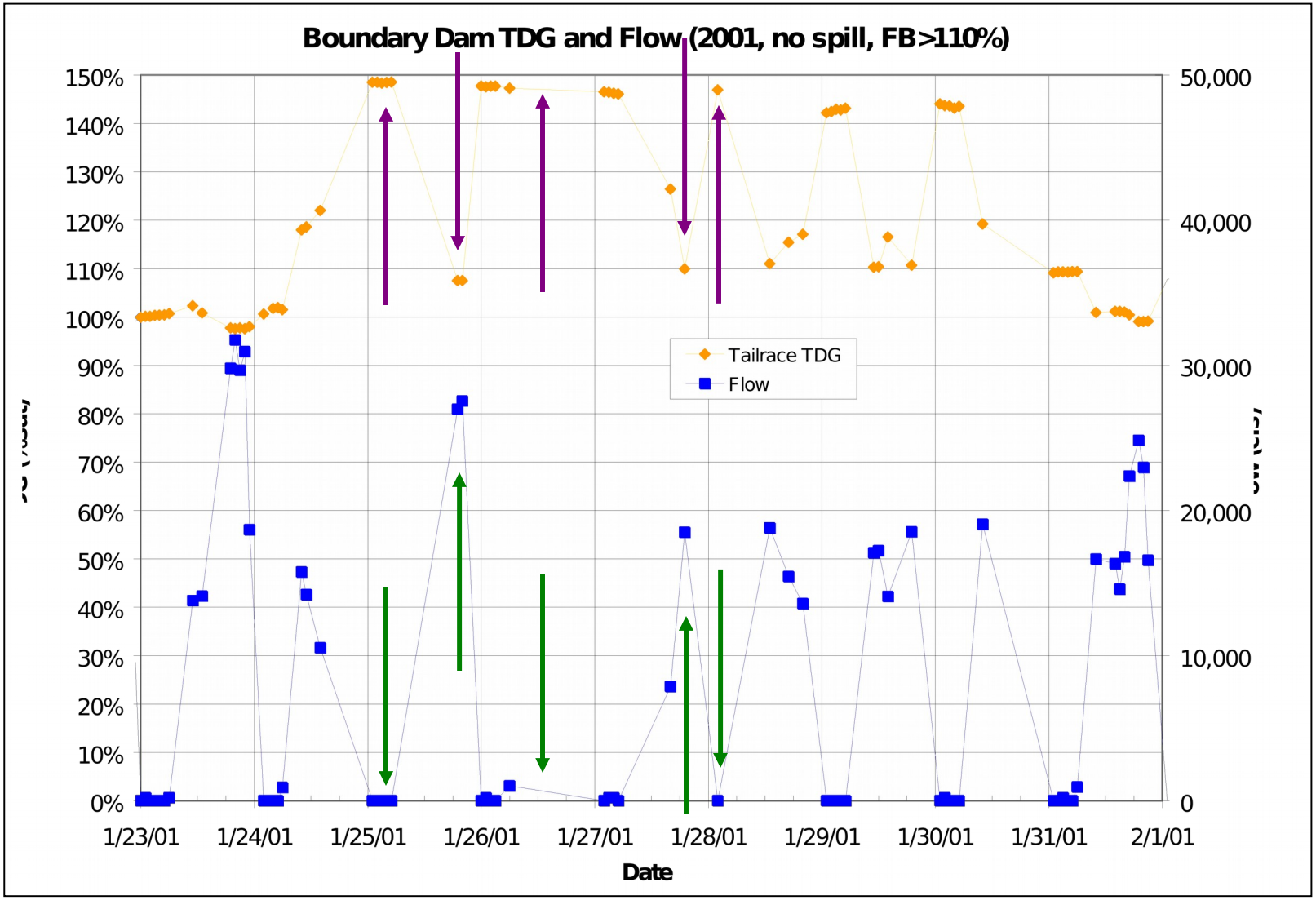
Overview of the Draft Pend Oreille River TDG TMDL

- Boundary Dam TDG Generation by <u>powerhouse</u>
  - TDG above 110% in tailrace sometimes occurs when there is no spill and no forebay impairment
  - Usually occurs at very low flows
    - Powerhouse shutdown and start up
  - Related to air intake by turbines to prevent blade damage

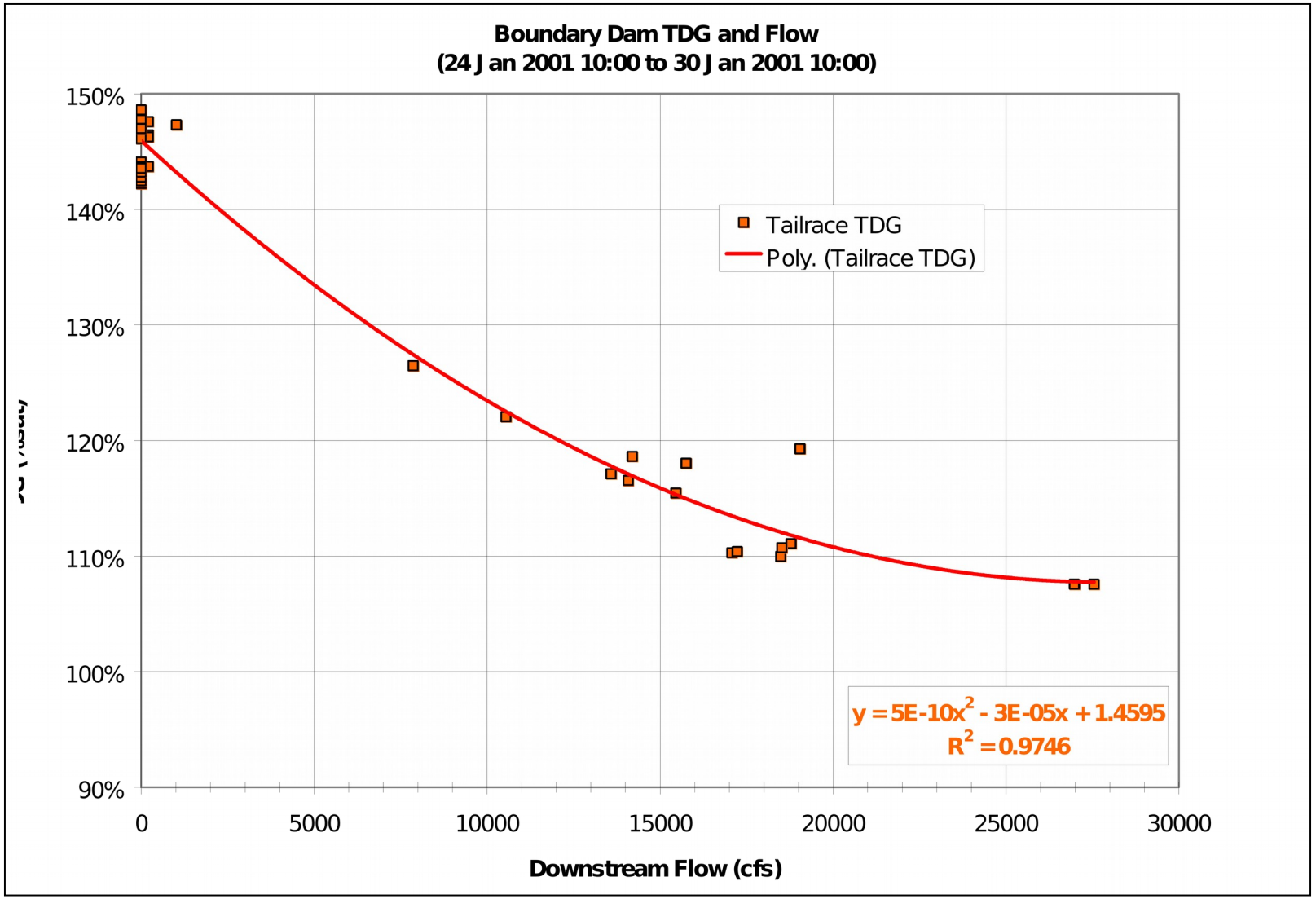
Overview of the Draft Pend Oreille River TDG TMDL



Overview of the Draft Pend Oreille River TDG TMDL



Overview of the Draft Pend Oreille River TDG TMDL



Overview of the Draft Pend Oreille River TDG TMDL

- Loading capacity and allocations
  - Equivalent to 110% saturation at low barometric pressure
- Compliance areas
  - Entire Pend Oreille River in Washington, except…
  - Aerated ("bubbly") zones below dams excluded
    - Compliance area begins at tailrace location specified in Implementation Plan
    - Draft location: existing tailrace monitoring sites.
- Compliance flows
  - Idaho State Line to Kalispel Reservation: all flows
  - Kalispel Res. to Int'l Border: only below 7Q10 flood flow

Overview of the Draft Pend Oreille River TDG TMDL

- TMDL review and submittal
  - TMDL = technical analysis (what you just saw)

    + implementation plan

Overview of the Draft Pend Oreille River TDG TMDL

- Implementation Plan
  - Box Canyon Dam 401 Certification (effective July 2005)
    - TDG Abatement Plan
    - Water Quality Monitoring Plan
  - Boundary Dam FERC relicensing (due 2011)
    - Pre-application Document (May 2006)
    - Proposed Study Plan (October 2006)
  - Upstream Sources
    - Jurisdiction of Idaho and Montana
    - U.S. EPA oversight

Overview of the Draft Pend Oreille River TDG TMDL

- Boundary Dam "Super Six"
  - Throttle Sluice Gates
  - Roughen Sluice Gate Discharge
  - New Right Abutment Tunnel with Submerged Discharge
  - New Left Abutment Tunnel Intercepts Diversion Tunnel
  - Penstock/Draft Tube By-Pass
  - New Short Left Abutment Tunnel Next to Unit #51
- Stay tuned!
  - (Seattle City Light will provide details as planning continues)

Overview of the Draft Pend Oreille River TDG TMDL

- TMDL review and submittal
  - TMDL = technical analysis
    + implementation plan
  - Continue coordination with stakeholders
  - Formal review and public comment of final draft TMDL
  - WA issues for state waters and submits to EPA
  - EPA adopts for tribal waters and approves WA
  - Implementation

Overview of the Draft Pend Oreille River TDG TMDL

- Questions?
  - Contact info:
    - Paul Pickett, EAP Olympia
      (360) 407-6882
      ppic461@ecy.wa.gov
    - Jon Jones, WQP Spokane
      (509) 329-3481
      jojo461@ecy.wa.gov